

UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Lesson 1: Crop and Weed Identification

Competency/Objective: Identify crop and weed seeds and plants.

Study Questions

1. **What plant types and physical characteristics are used to identify crop and weed plants?**
2. **What are the characteristics of grass and grasslike plants?**
3. **What are the characteristics of legumes?**
4. **What are the characteristics of forbs?**
5. **What are the characteristics of woody plants?**
6. **What are the identifying characteristics of common weed plants?**
7. **What are the identifying characteristics of noxious weed plants?**
8. **What are the identifying characteristics of crop and weed seeds?**
9. **What weed seeds are included on the restricted noxious list?**
10. **What weed seeds are included on the restricted prohibited list?**

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit IV.
2. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992.
3. *Crop and Grassland Plant Identification Manual*. University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
4. *Growers Weed Identification Handbook* (Publication 4030). Cooperative Extension. University of California, Division of Agriculture and Natural Resources, 1991. (Available for free loan from MRCCTE, University of Missouri-Columbia.)
5. Transparency Masters
 - a) TM 1.1: Leaf Characteristics
 - b) TM 1.2: Cool- and Warm-Season Grass Growth
6. Activity Sheet
 - a) AS 1.1: Identifying Weeds of Missouri

UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Lesson 1: Crop and Weed Identification

TEACHING PROCEDURES

A. **Introduction**

This lesson will discuss the identifying characteristics of crop and weed seeds and plants. It is important for the producer to understand the differences and be able to identify, in particular, those weeds that can be harmful to the productive value of the crop. Early detection is necessary to effectively control weeds.

B. **Motivation**

1. Have students bring in plant samples from grasslands or crop fields near their homes. Discuss what types of plants can be found locally.
2. Divide the class into groups. Give each group a package of mixed seeds (e.g., corn, sunflower, and pinto beans). Have students separate and identify them. Discuss how they identified the seeds and why identification is important. While the students are divided into groups with the seeds separated, point out to them distinguishing characteristics of specific seeds. Refer to IML's *Crop Science* Student Reference for a review of identifying characteristics of crop and weed seeds.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

1. Discuss how plants can be classified other than by life cycles. Plants are also categorized according to their physical characteristics. Using the plants acquired during the Motivation, group the plants found locally into the four plant types. Leaf characteristics are the most varied. Using TM 1.1, review the characteristics of leaves.

What plant types and physical characteristics are used to identify crop and weed plants?

- a) Plant types
 - 1) Grasses and grasslike plants
 - 2) Legumes
 - 3) Forbs
 - 4) Woody plants
 - b) Physical characteristics
 - 1) Leaf shape
 - 2) Stem
 - 3) Flower
 - 4) Root
2. Separate grasses according to required temperature for growth. Point out examples of cool-season grasses, such as Kentucky bluegrass, orchardgrass, and smooth brome grass. Compare the differences to warm-season grasses, such as indiangrass, big blue stem, and switchgrass. Discuss the characteristics of both cool-season and warm-season grasses. Show TM 1.2 of Cool- and Warm-Season Grass Growth. Also refer to the *Crop and Grassland Plant Identification Manual* for more examples of grasses.

What are the characteristics of grass and grasslike plants?

- a) Characteristics
 - 1) Herbaceous
 - 2) Hollow stems
 - 3) Blades and stems joined directly at sheath
 - 4) Parallel venation on leaf blade
 - b) Cool-season grasses
 - 1) Grow when soil temperatures reach 40°F in early spring,
 - 2) Optimum growth with air temperatures from 59° to 77°F in spring and fall
 - 3) Dormant in summer
 - 4) Annuals or perennials
 - c) Warm-season grasses
 - 1) Grow when soil temperatures reach 60°F in spring, with optimum growth occurring when air temperatures increase from 77° to 104°F in summer
 - 2) Dormant in winter
 - 3) Annuals or perennials
3. Discuss the characteristics of legumes. Point out some examples of legumes, such as clovers, alfalfa, and birdsfoot trefoil. Refer to the *Crop and Grassland Plant Identification Manual* for details.

What are the characteristics of legumes?

- a) One-chambered fruit with seeds in a single row within the pod
 - b) Alternating leaf arrangement - usually connected to petiole
 - c) Network of veins
 - d) May be annuals, perennials, or biennials
 - e) Nodules with nitrogen-fixing capacity on most rooting systems
4. Other herbaceous plants that are neither grasses nor legumes are classified as forbs. Discuss the characteristics of forbs. Examples of forbs include sunflowers, thistles, and ragweed. Refer to the *Crop and Grassland Plant Identification Manual*.

What are the characteristics of forbs?

- a) Herbaceous (not woody) stems
 - b) Broadleaf plants
 - c) Commonly appear in pastures, fields, and native plant habitats
 - d) May be annuals, perennials, or biennials
 - e) Valued as wildlife food and cover
 - f) Prevent soil erosion
 - g) Some are noxious
5. Other nonherbaceous plants found in grasslands are woody plants. In crop production, most woody plants will be weedy saplings or small immature trees and shrubs. Examples of woody plants include wild rose, red cedar, and oak. Discuss the characteristics of woody plants. Refer to the *Crop and Grassland Plant Identification Manual*.

What are the characteristics of woody plants?

- a) Woody (nonherbaceous) stems
- b) Shrubs, vines, or trees
- c) Usually immature in grasslands
- d) Perennials

6. Explain that common weeds are relatively easy to control but reduce crop yields and increase production costs. Remind students that plants that are considered crops, such as corn and soybeans, are weeds if they are growing in the wrong field. Refer to the *Crop and Grassland Plant Identification Manual* to identify common weed plants. The *Growers Weed Identification Handbook* available from MRCCTE can also be used.

What are the identifying characteristics of common weed plants?

- a) Easy to control
 - b) Annual or perennial
 - c) Grass or forb
7. Explain that noxious weeds are difficult to control and that the presence of noxious weed seed in agricultural crop seeds is restricted in Missouri. Refer to Table 1.1 in the Student Reference for detailed characteristics of noxious weeds.

What are the identifying characteristics of noxious weed plants?

- a) Crowds out desirable crops
 - b) Robs crops of plant nutrients and moisture
 - c) Causes extra labor in cultivation
 - d) Annual, biennial, or perennial
 - e) Grass or forb
 - f) Growing plants considered noxious
 - 1) Musk thistle
 - 2) Scotch thistle
 - 3) Canada thistle
 - 4) Multiflora rose
 - 5) Bindweed
 - 6) Purple loosestrife
 - 7) Marijuana (*Cannabis sativa*)
 - 8) Johnsongrass
8. The Bureau of Feed and Seed administers laws and regulations to ensure that seeds are labeled consistently and accurately. Discuss with the class various characteristics of crop and weed seeds. Refer to IML's *Crop Science* curriculum for further information.

What are the identifying characteristics of crop and weed seeds?

- a) Size
 - b) Shape
 - c) Color
 - d) Surface markings
 - e) Other botanical characteristics
9. Refer to the current Missouri Seed Law and Regulations for weed seeds listed as restricted noxious. Restricted noxious weed seeds are defined as highly objectional in fields, lawns, or gardens of Missouri and are difficult to control by good cultural practices. Seed companies must list these seeds, if any, on labels.

What weed seeds are included on the restricted noxious list?

- a) Red sorrel
- b) Curled dock
- c) Dodder
- d) Buckhorn plantain
- e) Black nightshade

- f) Giant foxtail
 - g) Hedge bindweed
 - h) Leafy spurge
 - i) Hoary cress
 - j) Purple moon flower
 - k) Quackgrass
 - l) Russian thistle
 - m) Slender oats
 - n) Wild garlic
 - o) Wild onion
 - p) Wild oats
 - q) Yellow star thistle
10. Discuss the weed seeds that are listed on the restricted prohibited list. Restricted prohibited weed seeds are defined by law as the seeds of weeds that when established are highly destructive and difficult to control in this state by good cultural practices. Explain that each state determines its own prohibited seed list. Seed companies must design seeds to certain state specifications.

What weed seeds are included on the restricted prohibited list?

- a) Canadian thistle
- b) Field bindweed
- c) Johnsongrass
- d) Sorghum alnum
- e) Musk thistle
- f) Balloon vine
- g) Serrated tussock

F. Other Activities

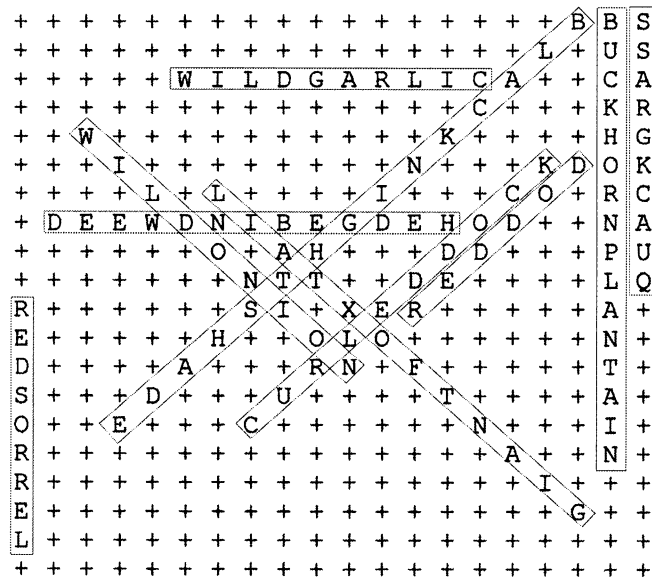
1. Take a field trip to a nearby pasture or field and discuss the different types of plants found there. Have the students explain the different plant uses for producers, livestock, wildlife, and others.
2. Have students create their own plant guide with samples collected from local grasslands and crop field areas. Guides should include 25 different plants with at least three from each classification. Plant samples should be collected, mounted, and labeled according to plant type: grass (warm- or cool-season), legume, forb, or woody.

G. Conclusion

The ability to identify the differences between crops and weeds is important to the production of a profitable crop. Proper seed and plant identification plays a part in the process of reducing weeds and in turn reducing the damage to crops.

H. **Answer to Activity Sheet**

AS 1.1



AS 1.2

Answers will vary.

I. **Answers to Evaluation**

1. b
2. e
3. c
4. a
5. d
6. d
7. b
8. a
9. a
10. b
11. c
12. e
13. a
14. b
15. b
16. a
17. a
18. a
19. b
20. b
21. c
22. They are nonherbaceous with woody stems.
23. Common, noxious, prohibited
24. *Missouri Seed Law and Regulations*

EVALUATION

Match the characteristics in the left column with the correct plant type in the right column.

- | | |
|--|----------------------|
| 1. _____ Plant with seeds in a single row within the pod | a. Cool-season grass |
| 2. _____ Herbaceous, broadleaf plant growing in a native habitat | b. Legume |
| 3. _____ Nonherbaceous perennial plant | c. Woody plant |
| 4. _____ Plant with parallel venation and optimum growth from 59° to 77°F | d. Warm-season grass |
| 5. _____ Plant with parallel venation and optimum growth from 77° to 104°F | e. Forb |

Match the plant in the left column with the plant type in the right column.

- | | |
|-----------------------|----------------------|
| 6. _____ Corn | a. Cool-season grass |
| 7. _____ Soybeans | b. Legume |
| 8. _____ Wheat | c. Woody plant |
| 9. _____ Orchardgrass | d. Warm-season grass |
| 10. _____ Alfalfa | e. Forb |
| 11. _____ Red cedar | |
| 12. _____ Cotton | |

Match the weed seed in the left column with the correct designation in the right column.

- | | |
|-------------------------------|-------------------------------|
| 13. _____ Yellow star thistle | a. Restricted noxious seed |
| 14. _____ Johnsongrass | b. Restricted prohibited seed |
| 15. _____ Canada thistle | |
| 16. _____ Wild onion | |
| 17. _____ Giant foxtail | |
| 18. _____ Dodder | |
| 19. _____ Balloon vine | |

Circle the letter that corresponds to the best answer.

20. Which plant types are the dominant species in a pasture, grassland, or range?

- a. All plant species
- b. Grasses and legumes
- c. Forbs and grasses
- d. Woody plants, grasses, and legumes

21. Which plant species is not usually cultivated for agricultural production?

- a. Grasses
- b. Legumes
- c. Forbs
- d. Grasses and legumes

Complete the following short answer questions.

22. What makes woody plants different from all the other plant types?

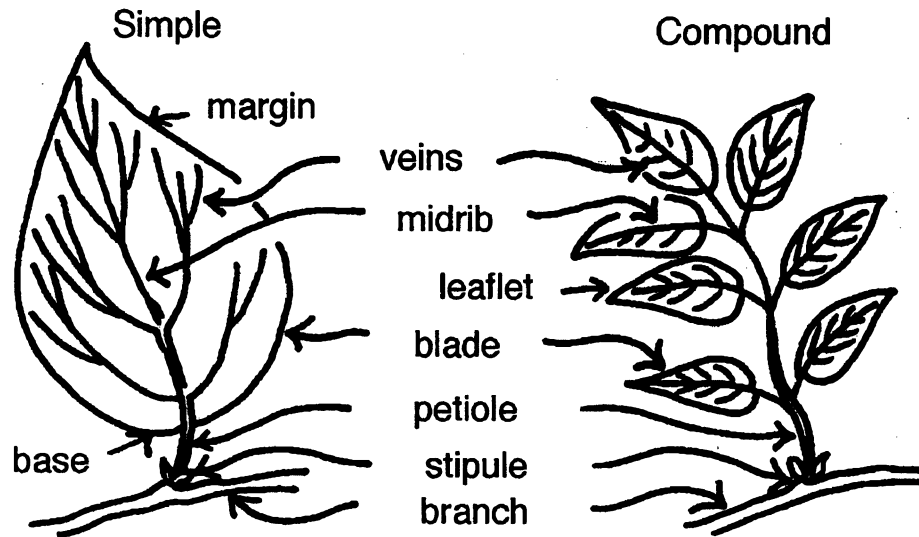
23. What are three types of weed plants?

- a.
- b.
- c.

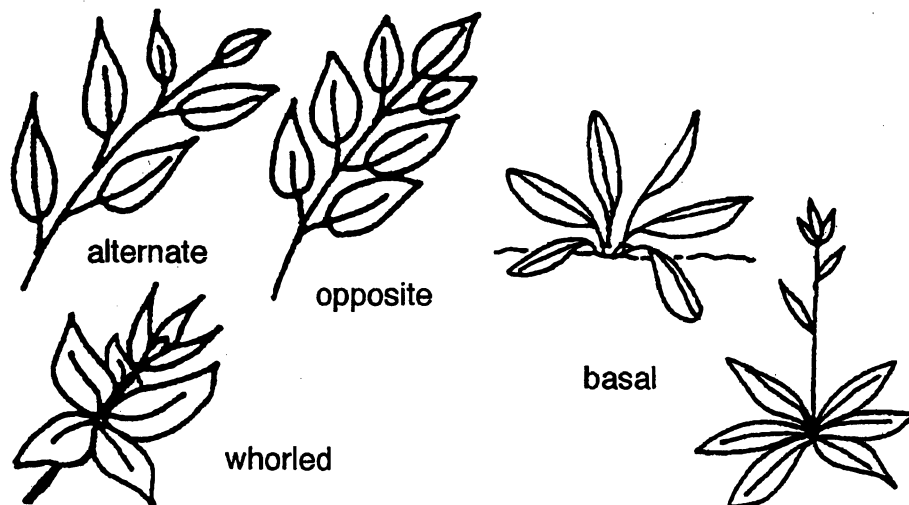
24. What reference should be used for information concerning weed seeds listed as restricted noxious?

Leaf Characteristics

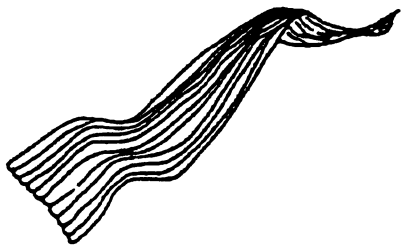
Leaf Parts



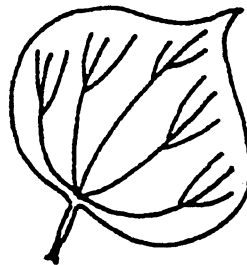
Leaf and Bud Arrangement



Leaf Venation



parallel



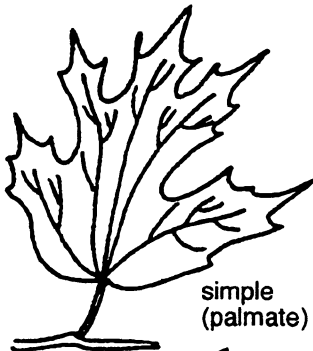
palmate



pinnate

Leaf Types

Simple

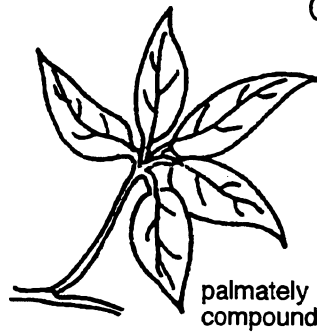


simple
(palmate)

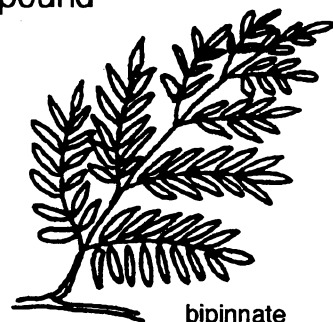


simple
(pinnate)

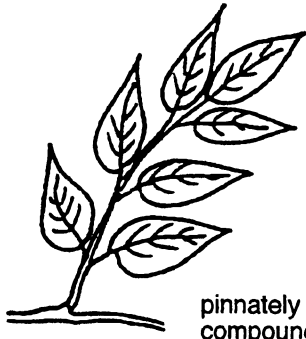
Compound



palmately
compound



bipinnate

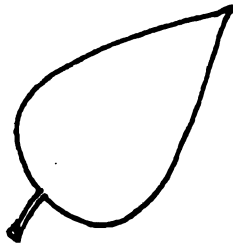


pinnately
compound

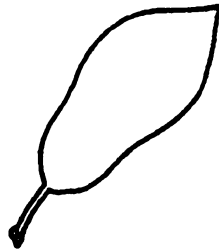


trifoliate

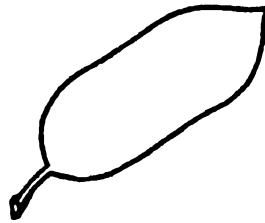
Leaf Shapes



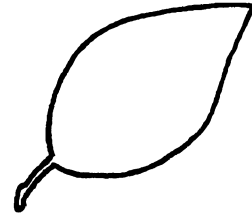
ovate



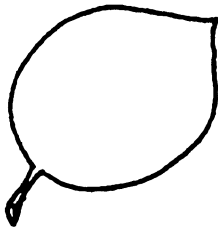
obovate



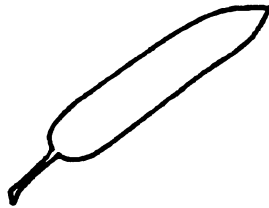
oblong



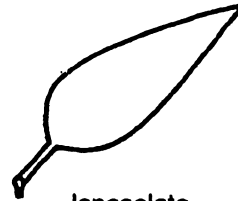
oval



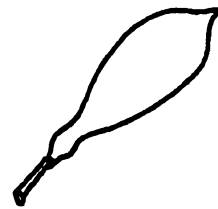
orbicular



linear



lanceolate



oblanceolate

Common Leaf Margins

entire



serrulate



serrate



doubly
serrate



dentate



crenate



sinuate



undulate



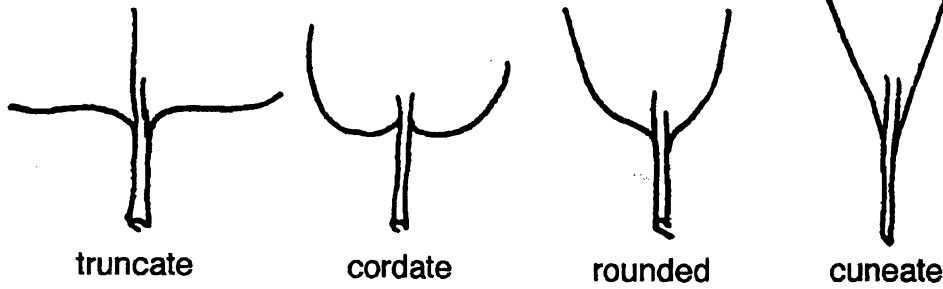
lobed



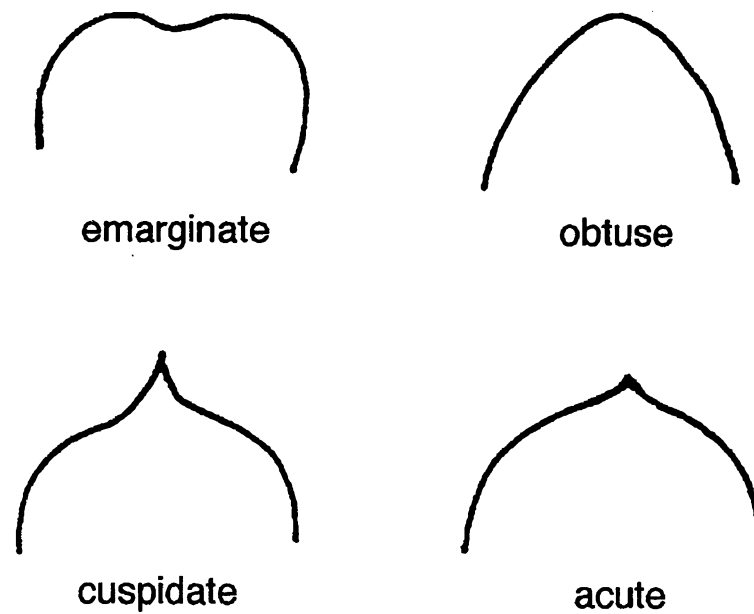
incised



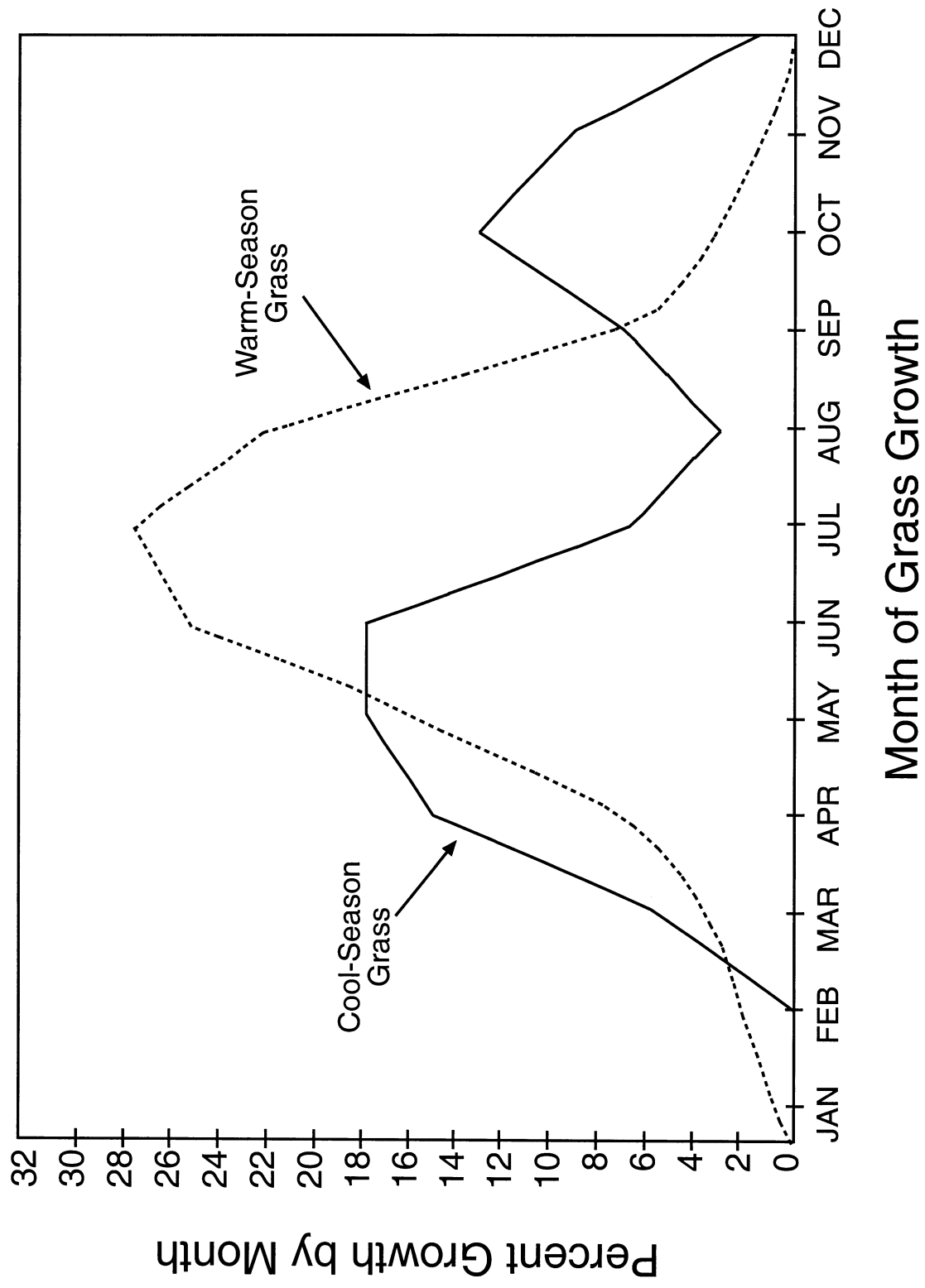
Common Base Shapes



Common Tip Shapes



Cool- and Warm-Season Grass Growth



Lesson 1: Crop and Weed Identification

Name _____

Identifying Weeds of Missouri**Objective:** Students will identify terms used to identify weeds found in Missouri.**Directions:** Complete the word search puzzle below by finding the following ten noxious weeds listed below that are found in Missouri. There are no blank spaces between words in the word search.

Black Nightshade
Curled Dock
Quackgrass
Wild Onion

Buckhorn Plantain
Dodder
Red Sorrel

Giant Foxtail
Hedge Bindweed
Wild Garlic

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X E V D J P L T G S Y H C D C U A B B S
N W A Z A N R D F G X M C U X W L L U S
R V V L E W I L D G A R L I C A E J C A
J D D F X O G B E Q L K P C C E F N K R
P X W H L Q X K D K Y I N K F U D G H G
X M A I W Q D B C W S M N N U N K D O K
W K O J L X L O I N J I Y D J C O B R C
C D E E W D N I B E G D E H O D E A N A
J A H H T E O V A H V W X D D P U L P U
A D E W M D F N T T Q Q D E L D M M L Q
R X B I H N F S I V X E R I I K T A A T
E T G I W O H Q E O L O Q O Z K J J N S
D U N F N A L R W R N L F G W V H V T A
S U H O D V I Y U Z R X G T F W A A A W
O H S E M G A C D I L N T R N C Q H I O
R E K I P Y R Y T N B T Q F I A A S N N
R X D E C O H Q E L O H B L Y L I A O X
E A I T A M P B A B K P Y Y Z H O G D N
L P D F G N G O G T G R A L L U V R Y X
W S P T W D F J Y L Y O R T Z W K T S U

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UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Lesson 2: Crop Selection

Competency/Objective: Identify factors that determine crop selection.

Study Questions

1. What factors affect crop selection?
2. How does the growing region affect crop selection?
3. What are the maturity groups for selected crops?
4. What economic factors influence crop selection?

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit IV.
2. Transparency Masters
 - a) TM 2.1: Spring Frost Dates
 - b) TM 2.2: Fall Frost Dates
 - c) TM 2.3: Average Annual Rainfall
 - d) TM 2.4: Soybean Maturity Zones
3. Activity Sheet
 - a) AS 2.1: Crop Selection Factors

UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Lesson 2: Crop Selection

TEACHING PROCEDURES

A. **Review**

Lesson 1 taught what characteristics to look for when identifying plants. This lesson will expand on that information to include growth characteristics to aid the producer in selecting a specific crop.

B. **Motivation**

Ask the students to survey the grain producers in their area, listing not only what crops are grown, but also what varieties are planted. Share this information with the class to draw conclusions on a consensus of producer preferences.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

1. Discuss with the class various factors that affect crop selection.

What factors affect crop selection?

- a) Climate
 - 1) Rainfall
 - 2) Temperature
 - b) Soil conditions
 - 1) Soil type
 - 2) Soil fertility
 - (a) Existing nutrient supplies
 - (b) Fertilizer recommendations
 - c) Field history
 - 1) Past rotations
 - 2) Current cropping options
 - 3) Current cultural and biological conditions
 - d) Equipment resources
 - e) Economics
 - 1) Input costs
 - 2) Crop value
 - f) Market access
2. Ask students to identify how the growing region affects crop selection. Display TM 2.1 and 2.2 and discuss the average spring and fall frost dates of the United States. TM 2.3 shows the average annual rainfall amounts in Missouri. Also refer to Table 2.1 in the Student Reference to review annual water usage for crops grown in Missouri.

How does the growing region affect crop selection?

- a) Temperature
 - 1) Cool- and warm-season grasses
 - 2) Planting dates to avoid frost damage
- b) Rainfall

- 1) Annual water usage of crops
 - 2) Availability of water
 - c) Soil characteristics
3. Ask students to identify maturity groups for selected crops. Refer to TM 2.4 as an example of maturity groups for soybeans in Missouri.

What are the maturity groups for selected crops?

- a) Corn
 - 1) Full season
 - 2) Mid-season
 - 3) Late season
 - b) Soybeans
 - 1) Maturity groups for Missouri include II through VI.
 - 2) May use an earlier maturing seed if double-cropping.
 - c) Wheat
 - 1) Hard red winter
 - 2) Hard red spring
 - 3) Soft red winter
 - d) Sorghum
 - 1) Similar to corn in planting dates
 - 2) Four basic maturity groups
 - e) Cotton
 - 1) New World cotton
 - (a) Upland
 - (b) Pima
 - 2) Old World cotton
 - (a) Tree
 - (b) Levant
 - f) Rice
 - 1) Very early maturing
 - 2) Early maturing
 - 3) Intermediate or late maturing
 - g) Forages
 - 1) Cool season
 - (a) Grasses - fescue, orchard grass, ryegrass, timothy
 - (b) Legumes - bird's-foot trefoil, alsike clover, ladino clover
 - (c) Thrive when moisture is adequate and temperatures are between 65 and 75°F
 - (d) Exhibit vigorous growth in the spring and fall months
 - 2) Warm season
 - (a) Initiate growth during late April or early May
 - (b) Produce 65 to 75% growth from mid-June to mid-August
 - (c) Soils with low moisture-holding capacity, low pH, low phosphorus levels
 - (d) Grasses - big bluestem, Indiangrass, switchgrass
 - (e) Legumes - alfalfa, crownvetch, lespedeza
4. Discuss economic factors that influence crop selection. Emphasize the importance of developing a marketing plan.

What economic factors influence crop selection?

- a) Land
- b) Labor
- c) Capital
- d) Management

F. ***Other Activity***

Have a crop production specialist from a local seed supplier visit the class and discuss what seeds are sold to producers in that area.

G. ***Conclusion***

A grain producer has several factors to consider before selecting a specific crop and the variety of the crop planted. These factors include the climate, soil conditions, length of growing season, and economic factors. A relatively new problem has developed for producers with the advent of certain crop weeds that have developed an immunity to herbicides. This is leading producers to consider different methods of weed control.

H. ***Answers to Activity Sheet***

1. e
2. j
3. b
4. i
5. f
6. a
7. l
8. k
9. g
10. d
11. h
12. c

I. ***Answers to Evaluation***

1. a
2. b
3. b
4. Any four of the following: climate, soil conditions, field history, equipment resources, economic demands, or market access
5. Temperature, rainfall, soil characteristics
6. Different maturity groups may reduce the damage of diseases and environmental stress while also spreading out the harvest time and workload.
7. Land, labor, capital, management

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following crops are not considered a “cool-season” plant?
 - a. Corn
 - b. Wheat
 - c. Fescue
 - d. Oats
2. Which type of wheat is predominately grown in Missouri?
 - a. Hard red spring
 - b. Hard red winter
 - c. Soft red winter
 - d. Soft red summer
3. Rice is grown in the _____ part of Missouri.
 - a. Northeast
 - b. Southeast
 - c. Northwest
 - d. Southwest

Complete the following short answer questions.

4. List four of the six major factors that must be considered when making the selection of a specific crop.
 - a.
 - b.
 - c.
 - d.
5. What three factors determine growing regions for specific crops?
 - a.
 - b.
 - c.
6. Explain why a corn producer might plant two different maturity groups of corn.

7. List the four major economic factors that may influence a crop selection.

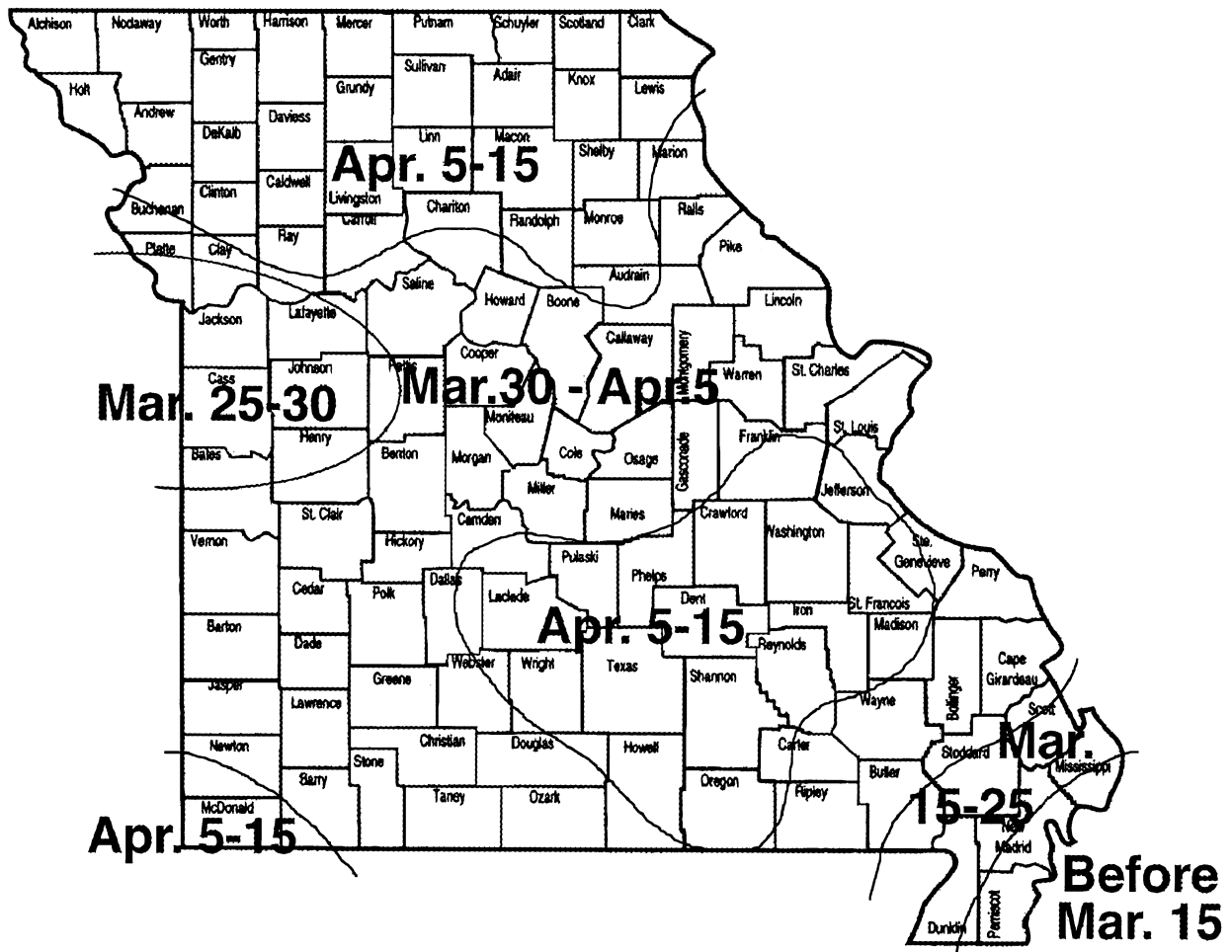
a.

b.

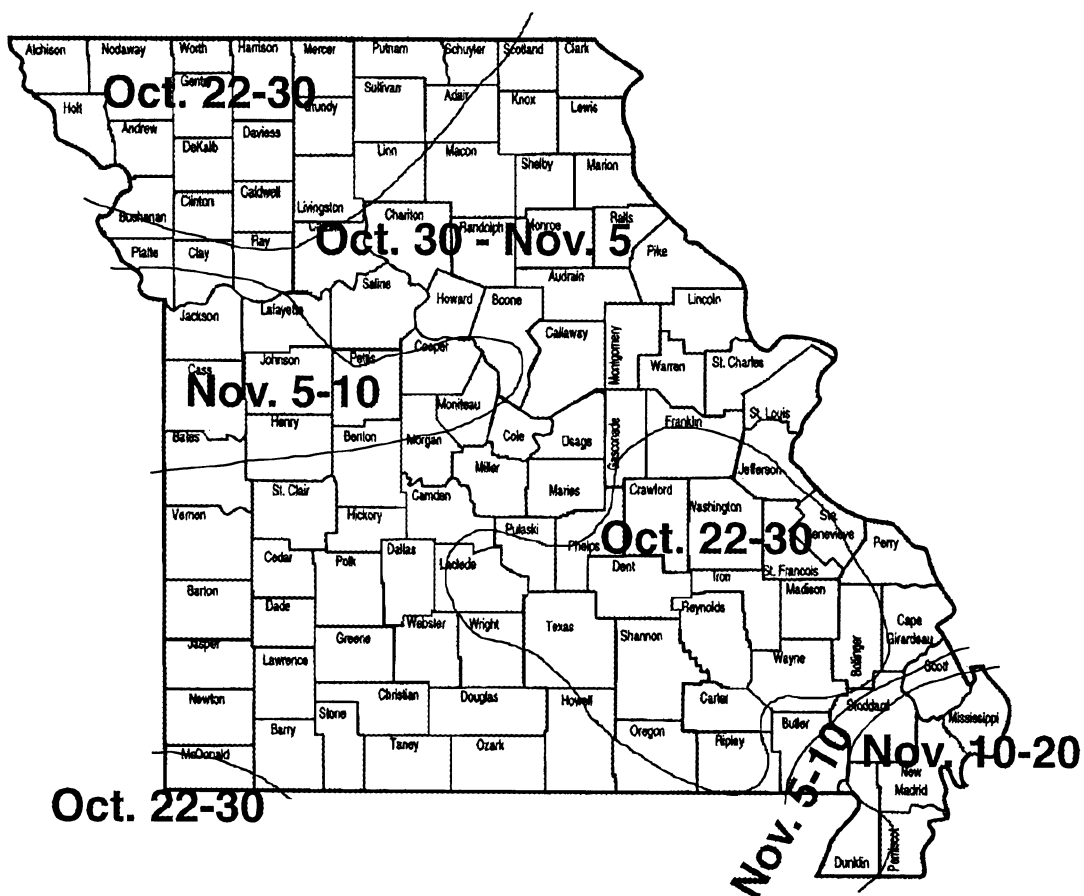
c.

d.

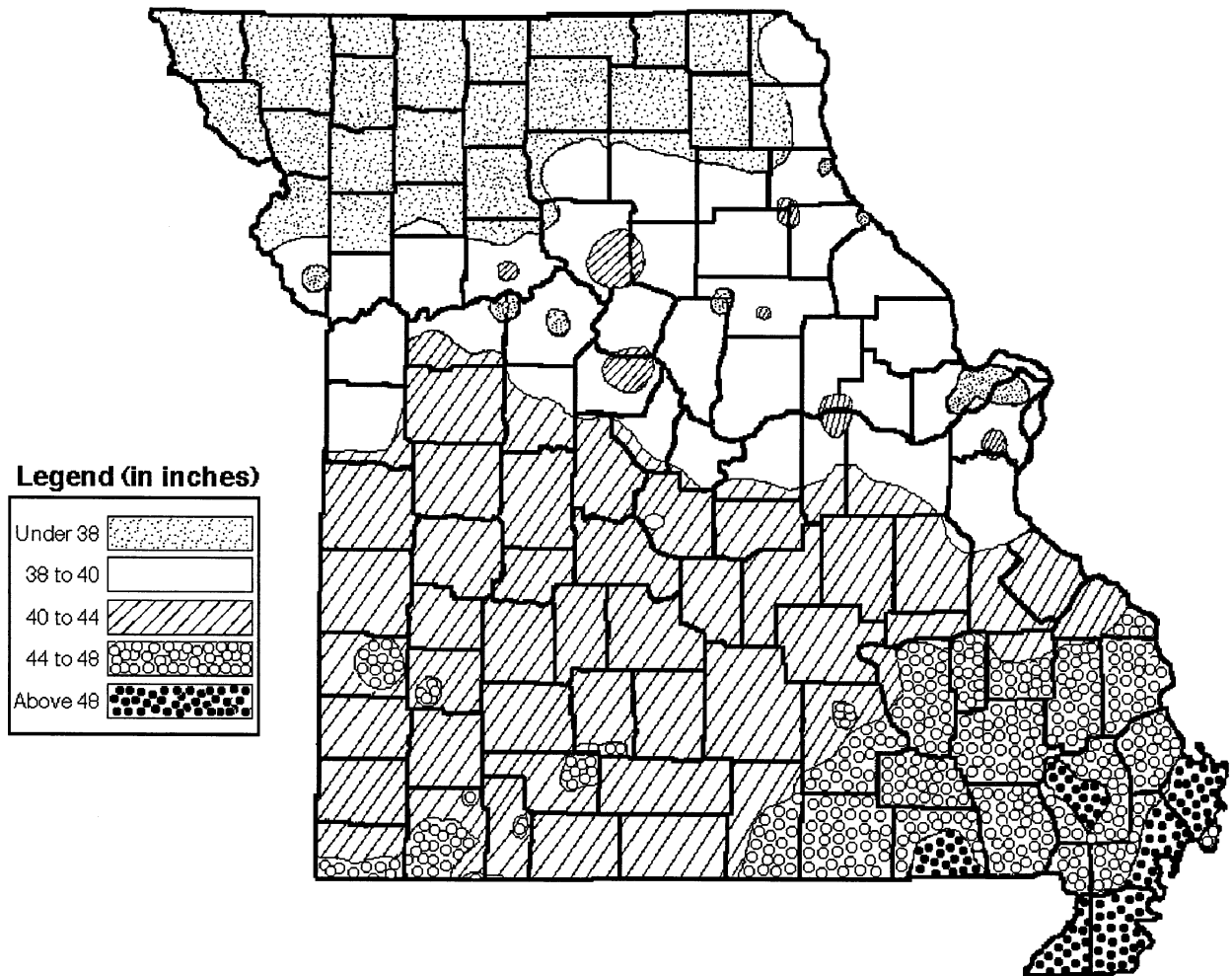
Spring Frost Dates



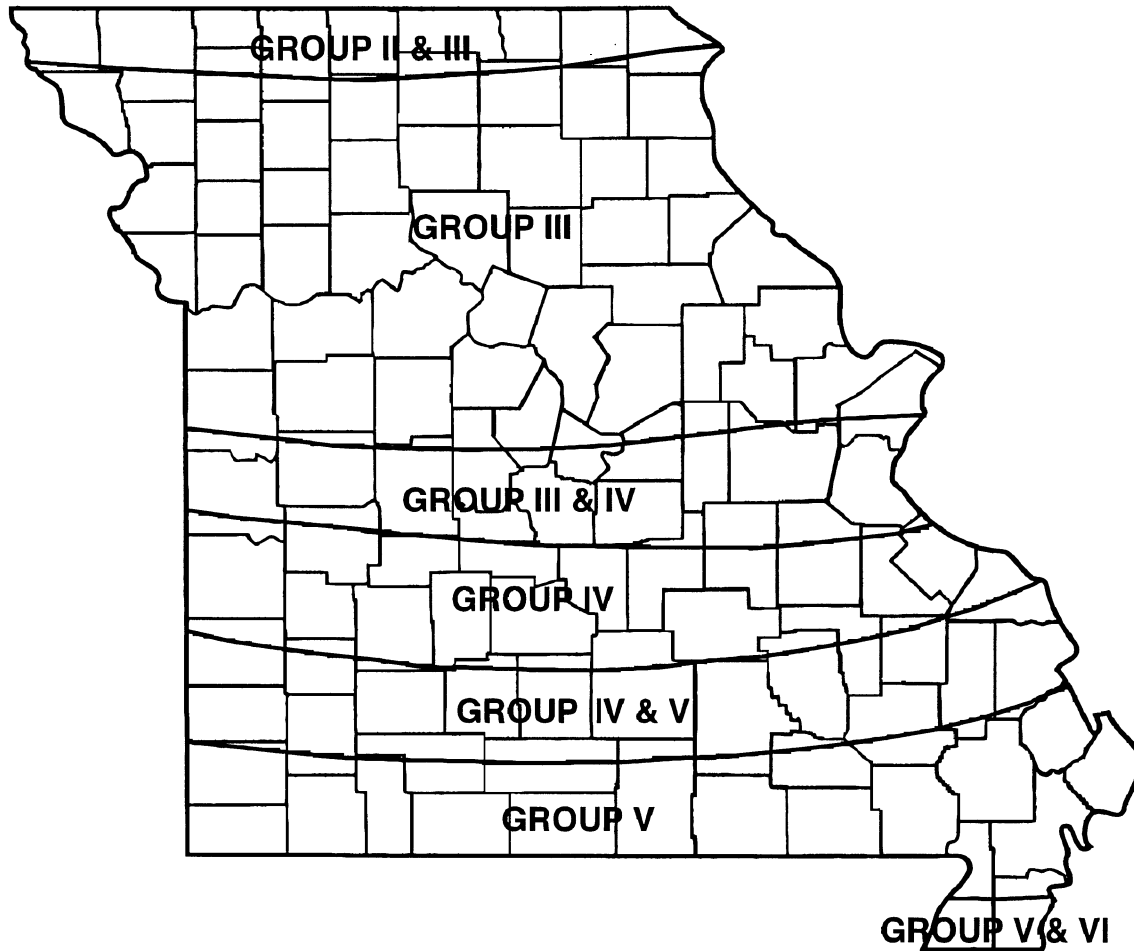
Fall Frost Dates



Average Annual Rainfall



Soybean Maturity Zones



Lesson 2: Crop Selection

Name _____

Crop Selection Factors**Objective:** Students will demonstrate a knowledge of factors used to select certain crops.**Directions:** Match the definition in the right column to the correct crop selection factor in the left column.

- | | |
|----------------------------------|--|
| 1. _____ Input costs | a. Determined by length of its growing season |
| 2. _____ Growing region | b. Wheat, oats, barley, fescue |
| 3. _____ Cool season crops | c. Past planting of crops and their rotation |
| 4. _____ Warm season crops | d. Land, labor, capital, and management |
| 5. _____ Soil condition | e. Fuel, seed, chemicals, and fertilizer |
| 6. _____ Maturity group | f. Determined by soil test to find its nutritive value |
| 7. _____ Capital | g. Type of cotton grown in the United States |
| 8. _____ Weed control strategies | h. Planting more than one maturity group of a crop to spread out the harvest times |
| 9. _____ Upland | i. Corn, soybeans, cotton, grain sorghum |
| 10. _____ Inventory of resources | j. Determined by temperature, rainfall, and soil condition |
| 11. _____ Calendarizing a crop | k. Plowing, burning, grazing animals, crop rotation |
| 12. _____ Field history | l. Money required to purchase fuel, seed and fertilizer |

UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Lesson 3: Crop Seed Selection

Competency/Objective: Utilize seed tag information to select quality seed.

Study Questions

1. What are the characteristics of quality seeds?
2. What information is included on a seed tag?
3. What factors determine optimum seeding rates?
4. How does the seeding rate determine equipment calibration?
5. What are the availability options for seed?
6. How do plant patents affect seed availability?
7. What are the advantages and disadvantages of using certified seed?

References

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit IV.
2. Humphrey, John Kevin. *Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1992, Lessons 3 and 4.
3. *MFA Agronomy Guide*. Available from any MFA AgriService Center or MFA Incorporated, 201 Ray Young Drive, Columbia, MO 65201 (573-874-5111).
4. Transparency Master
 - a) TM 3.1: Seed Tag
5. Activity Sheets
 - a) AS 3.1: Seed Information and Germination Test
 - b) AS 3.2: Identify Plant Seeds

UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Lesson 3: Crop Seed Selection

TEACHING PROCEDURES

A. **Review**

Previous lessons have discussed identification of weed plants and seeds. Selection of seeds requires an understanding of the information provided on the seed tag, seeding rates, and available options for seeds.

B. **Motivation**

1. Ask students to bring to class seed tags from home or a local seed dealer. Compare label information between crop seed varieties.
2. Invite a local seed dealer to visit the class to explain how seed is acquired and marketed.

C. **Assignment**

D. **Supervised Study**

E. **Discussion**

1. To ensure an adequate crop stand, quality seed should be used when planting the crop. Crop yields can be affected by the seed used. Agronomists estimate the yields from using good seed to be 10 to 20% greater than yields resulting from poor quality seed. Discuss the characteristics of quality seeds. Refer to the *MFA Agronomy Guide* for information on seed selection.

What are the characteristics of quality seeds?

- a) Good genetic potential
 - b) Good germination
 - c) Proper size and development
 - d) Uniformity in size and shape
 - e) Absence of seedborne diseases and insects
 - f) Absence of prohibited, noxious, and other weed seeds
 - g) Absence of other crop seeds and other varieties
 - h) Absence of inert materials
2. Explain to the students that state law requires seed to be labeled with the name, complete address and zip code of the labeler, along with the quality components listed below. TM 3.1 shows an example of a seed tag containing the seed quality information.

What information is included on a seed tag?

- a) Percent pure seed
- b) Percent inert matter
- c) Percent other crop
- d) Percent weed seed
- e) Percent germination
- f) Percent hard seed
- g) Percent total germination
- h) Net weight
- i) Lot number

- j) State of origin
 - k) Test date
 - l) Kind and number of noxious weeds
 - m) Other possible components
 - 1) Seed count
 - 2) Treated seed (fungicide) - labels required by law
3. Proper stand establishment will increase the chances of a good yield if the weather is conducive to proper plant growth. The desired plant population depends on several factors, one of which is the seeding rate.

What factors determine optimum seeding rates?

- a) Type of crop
 - b) Use of crop
 - c) Pure live-seed ratio or percent
 - 1) Ratio of weight of the viable seed of the cultivar being seeded to the total weight of the seed stock
 - 2) May include nonviable seeds, weed seeds, and inert matter
 - d) Seed quality
 - 1) Based on germination rate and other factors
 - 2) Low seed quality - increase rate of seeding
 - e) Time of seeding
 - 1) Climatic conditions can reduce stand if planted after optimum time.
 - 2) Increase seeding rates if planting before or after optimum planting dates.
 - f) Soil moisture and productivity
 - 1) Productive soils sustain recommended seeding rates.
 - 2) Excessive moisture retards germination and may cause rotting.
 - g) Method of seeding
 - h) Row width
4. Discuss with students how the seeding rate will determine how equipment is calibrated. Have available a copy of an owner manual for a planter that explains how to set calibration.

How does the seeding rate determine equipment calibration?

- a) Calibrate planting equipment
 - 1) Varies with type and brand of equipment
 - 2) Owner manual guidelines
 - (a) Adjust to achieve desired seed rate
 - (b) Planter's maximum speed for given planting rate
 - b) Check for worn parts
 - c) Check calibration before going to planting field
 - d) Check calibration in the planting field
5. Certified seed is sold to producers with strict production guidelines to ensure genetic quality. Discuss certified seed and the four classes. Using the seed tags brought in for the motivation, identify the seed class for each example.

What are the availability options for seed?

- a) Criteria for certified seed
 - 1) Seed must be grown from registered or certified seed stock.
 - 2) Crops produced must pass inspection for mixtures, weeds, and diseases.
 - 3) Harvested crop must attain standard of perfection set by seed association.
- b) Seed dealers
 - 1) Breeder seed - used to produce foundation seed

- (a) Seed trade is conducted only between the breeder and the company.
 - (b) Small quantities are produced by commercial seed companies.
 - 2) Foundation seed - the parent line for registered seed and/ or certified seed
 - (a) Seed trade conducted only between the breeder and the company
 - (b) Requires a white identification tag
 - 3) Registered seed - produced from foundation seed
 - (a) May be used to produce certified seed or is sold directly to producers
 - (b) Usually grown by producers for a company
 - (c) Requires a purple identification tag
 - 4) Certified seed - produced from foundation or registered seed
 - (a) Sold directly to producers by a seed dealer
 - (b) Requires blue identification tag
 - c) Exported seed
 - 1) Organization for Economic Cooperation and Development (OECD) sets requirements.
 - 2) Seed must meet minimum requirements to be tagged with OECD tag.
 - d) Local producers (only if permissible under Plant Variety Protection Laws)
 - 1) Practice is limited due to plant patents.
 - 2) Saved seed allows premiums above market price.
 - 3) Brown bag seed (NVS - no value stated) has a generic label with no quality or performance data.
6. A patent is an exclusive property right to an invention issued by the Commissioner of Patents and Trademarks, U.S. Department of Commerce. The rights granted are limited to the claims of the patent. Plant patents are granted for 17 years for plants when they are asexually reproduced with the exception of tuber-propagated plants or plants found in an uncultivated state. Patentable plants must have been reproduced by means other than seeds, such as by the rooting of cuttings or by grafting. Plant patents limits a producer's options for seed selection.

How do plant patents affect seed availability?

- a) Eliminates the option of saving seed from genetically superior seed
 - b) Requires new seed purchases yearly
 - c) May require contract agreements in specific production and marketing programs
- 7. Research has shown marked benefits from using certified seed. Many say the cost of purchasing new seed each year is a disadvantage, but considering the improved performance of certified or professionally grown seed over brown bag or saved seed, it is really an advantage.

What are the advantages and disadvantages of using certified seed?

- a) Advantages
 - 1) Guaranteed to be the variety advertised
 - 2) Guaranteed minimum germination rate
 - 3) Guaranteed to meet weed, disease, and insect contamination standards
- b) Disadvantages - cost

F. Other Activities

- 1. Have students research various seed companies.
- 2. Develop seed judging activities for the students.

G. **Conclusion**

Each crop grown will have its own challenges regarding seed selection. The producer needs to be aware of all options available to make the best decision regarding the use of certified seed. Seeding rates can increase potential yield and affect the profit levels of the operation.

H. **Answers to Activity Sheets**

AS 3.1

Answers will vary.

AS 3.2

Answers will vary.

I. **Answers to Evaluation**

1. e
2. h
3. b
4. i
5. c
6. j
7. d
8. f
9. g
10. a
11. $.90 \times .95 = 86\%$
12. $8 / .86 = 9.3 \text{ lb/acre}$
13. Read the owner manual
14. U.S. Department of Commerce (Bonus: Commissioner of Patents and Trademarks)
15. Any five of the following:
 - a) Good genetic potential
 - b) Good germination
 - c) Proper size and development
 - d) Uniformity in size and shape
 - e) Absence of seedborne diseases and insects
 - f) Absence of other crop seeds and other varieties
 - g) Absence of inert materials

UNIT IV - IDENTIFYING AND SELECTING CROPS AND SEEDS

Name_____

Lesson 3: Crop Seed Selection

Date_____

EVALUATION

Match the definition of the left to the term on the right.

- | | |
|--|----------------------|
| 1. _____Seed produced from foundation or registered seed and sold to producers | a. Soybean seed |
| 2. _____The parent line for registered or certified seed | b. Breeder seed |
| 3. _____Seed used to produce foundation seed | c. Plant patents |
| 4. _____Seed sold in brown bags with no seed tags | d. Seeding rate |
| 5. _____Requires the producer to purchase new seed yearly | e. Certified seed |
| 6. _____Requires labeling by law | f. Corn seed |
| 7. _____The amount of seed planted in a given area | g. Pure live seed |
| 8. _____Planted at populations of 18,000 to 32,000 | h. Foundation seed |
| 9. _____The weight of the viable seed compared to the weight of the seed stock | i. No variety stated |
| 10. _____Planted at populations of 130,000 to 170,000 | j. Treated seed |

Answer the following short answer questions.

11. If a seed tag stated percent germination at 90% and the purity at 95%, what is the pure live-seed ratio?

12. If the recommended seeding rate is based on 100% pure live-seed at 8 pounds per acre, what is the appropriate seeding rate using the seed in question 11?

13. What is the first and most important step in setting the seeding rate and equipment calibration?

14. What agency within the U.S. government issues plant patents?

15. List five characteristics of quality seeds.

a.

b.

c.

d.

e.

Certified Seed Tag

%Purity

Certifying Company

Variety

%Germination

CERTIFIED SEED

Labeled by: BASS JR, A.J.
P.O. Box 1542
Columbia, MO 65205

Variety: WILLIAMS 82

Crop: SOYBEANS

Purity	99.43%	Germination	90.00%	Lot #	AB-2
Inert	0.57%	Hard Seed	0.00%	Date Tested	1/92
Other Crop	0.00%	Total Germ.	90.00%	Net Wt.	60 lb.
Weed Seed	0.00%	Test Wt.	0	Out State #	
Nox Weed	0.00%	Seeds/lb	2043	Mo Permit	W-00717

91-92 1928128

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Miscellaneous Information

Name_____

Objective: Students will determine actual germination percentages with germination percentages listed on the seed tag.

Tin pie plate
Two paper towels
20 seeds (variety determined by instructor)
Information from seed tag
Masking tape

1. Transfer information from seed tag onto the table below.
2. Label your pie plate by placing a piece of tape with your name on it on the pie plate.
3. Place one paper towel into the pie plate.
4. Place the 20 seeds in a rectangular pattern on the paper towel in the pie plate.

A diagram of a petri dish. Inside the dish, there are two rows of dots representing seeds. A line points from the word "seeds" to the top row of dots. Another line points from the words "paper towel" to the bottom row of dots.

5. Place second paper towel over seeds and gently dampen towels until completely damp.
6. Check pan daily (once or twice daily) to ensure that proper moisture is maintained.
7. After five (5) days, check seeds for germination.
8. After 10 days, count the number of seeds germinated. Place in the box titled “% Test Germination” the percentage that germinated out of the 20 seeds tested.
9. Compare test germination percentage with stated germination percentage.

Note: This activity can be repeated with different varieties.

[illegible]

Lesson 3: Crop Seed Selection

Name_____

Identify Plant Seeds**Objective:** Students will identify plant seeds.**Directions:** The instructor will provide seeds for identification. Identify the seeds by their size, shape, color, surface markings, and common name of the plant seed.

Seed #	Size	Shape	Color	Surface Markings	Name of Plant Seed
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

UNIT V - SAFETY, ENVIRONMENT, AND LEGAL ISSUES

Lesson 1: Protecting Ourselves and Others

Competency/Objective: Identify potential crop production hazards to operators/producers.

Study Questions

1. **What are potential dangers to the operator when handling chemicals?**
2. **What are potential dangers from equipment operation in crop production?**
3. **What are the potential dangers from handling and storing crops?**
4. **What precautions should be taken to prevent personal injury from chemicals, equipment, and crop handling and storage?**
5. **What government agencies regulate and enforce safety issues?**

References:

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit V.
2. U.S. Environmental Protection Agency, U.S. Department of Agriculture Extension Service, *Applying Pesticides Correctly, A Guide for Private and Commercial Applicators*, Missouri Core Manual, MX 328, January 1997.
3. *Pesticide Safety*. Resources in Agricultural Safety (RAS) series. Available from Instructional Materials Laboratory, University of Missouri-Columbia, 1997.
4. Activity Sheet
 - a) AS 1.1: Farm Safety Survey

